KENWOOD

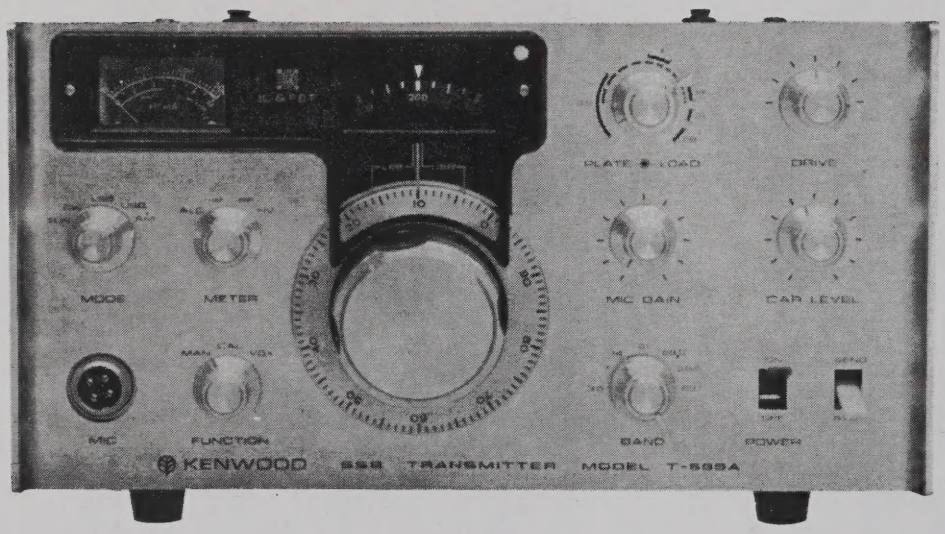
Model T-599A

OPERATING MANUAL

KENWOOD®

SSB TRANSMITTER

Model T-599A



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T-599A SPECIFICATIONS

FREQUENCY RANGE :	3.5 MHz Band — 3.5 to 4.0 MHz. 7.0 MHz Band — 7.0 to 7.3 MHz. 14.0 MHz Band — 14.0 to 14.35 MHz. 21.0 MHz Band — 21.0 to 21.45 MHz, 28.0 MHz Band — 28.0 to 28.5 MHz. 28.5 MHz Band — 28.5 to 29.1 MHz. 29.1 MHz Band — 29.1 to 29.7 MHz.
MODE :	USB or LSB (A3J), CW (A1), and AM (A3).
POWER REQUIREMENTS :	100/117/200/240 VAC, 50/60 Hz. Built-in power supply.
POWER CONSUMPTION :	350 watts maximum.
PLATE POWER INPUT :	SSB and CW — 3.5 through 21.0 MHz — 200 watts nominal 28.0 MHz — 160 watts nominal AM — 3.5 through 28.0 MHz — 80 watts nominal
POWER OUTPUT :	120 watts PEP nominal into 50 ohms for SSB (3.5 through 21.0 MHz). 100 watts PEP nominal into 50 ohms for SSB (28.0 MHz). 15 watts nominal into 50 ohms for AM (3.5 through 21.0 MHz). 10 watts nominal into 50 ohms for AM (28.0 MHz).
AUDIO INPUT IMPEDANCE :	600 ohms or 50 K ohms (switchable).
RF OUTPUT IMPEDANCE :	50 ohms with SWR less than 2:1.
FREQUENCY STABILITY :	Within 100 Hz during any 30 minute period after warmup. Within ±2 kHz during the first hour after 1 minute of warmup.
FREQUENCY READOUT :	Directly to 1 kHz on calibrated tuning dial.
CALIBRATION ACCURACY :	Within 2 kHz across the frequency range after calibration at zero.
BACKLASH :	Not more than 400 Hz when the dial is advanced from zero to 500 and returned to zero.
KEYING :	Block-bias keying. Semi-automatic break-in CW with sidetone provided.
AUDIO FREQUENCY RESPONSE :	400 to 2,600 Hz (−6 dB).
CARRIER SUPPRESSION :	Carrier better than 40 dB down from output signal.
SIDEBAND SUPPRESSION :	Unwanted sideband better than 40 dB down from output signal.
HARMONIC RADIATION :	Better than 40 dB down from output signal.
MODULATION SYSTEM :	Balanced modulation for SSB and low power modulation for AM.
SSB GENERATION SYSTEM :	Filter type.
METERING :	ALC (Automatic Level Control). IP (Plate Current). RF (Relative Power Output). HV (High Voltage).
VOX :	The T-599A has a built-in VOX circuit with adjustable VOX gain and delay.
TUBE AND SEMICONDUCTOR COMPLEMENT :	3 Vacuum Tubes (12BY7A driver and S2001 (6146) x 2 finals). 4 FETs. 1 IC. 30 Transistors. 34 Diodes. 3 Zener Diodes. 1 Capacity Variable Diode.
DIMENSIONS :	10.5″ wide x 5.5″ high x 12.2″ deep.
WEIGHT :	26.4 pounds. 34.2 pounds shipping weight.

SECTION 1 INTRODUCTION

1.1 INTRODUCTION

The T-599A is a modern, sophisticated solid state amateur radio transmitter employing only three vacuum tubes. The transmitter operates on all amateur bands between 3.5 and 30 MHz. All major electronic circuts are wired on easily removed or installed circuit boards. The T-599A includes many built-in features usually found as extras on other transmitters, including a VOX circuit. The T-599A also includes automatic level control (ALC), provisions for break-in CW with sidetone, and a built-in power supply. When the T-599A is used with the Kenwood R-599A receiver, the pair offer a highly versatile station allowing operation with either or both VFO's, fixed channel operation, and a 25 kHz calibrator.

Designed for operation on SSB, CW, and AM, the T-599A delivers more than 120 watts PEP output. The low power consumption of the T-599A results from its solid state design. Any complicated electronic equipment will be damaged if operated incorrectly, and this is no exception in the case of the T-599A. Please read all of the operating instructions before putting the T-599A on the air.

1.2 REQUIREMENTS FOR OPERATION

AC OPERATION

The T-599A requires no external power supply for operation. For fixed station operation, the T-599A power supply operates from any 120 VAC, 50/60 Hz power source capable of supplying 350 watts or more. The transmitter will operate from 100, 200 or 240 VAC power if the taps on the power transformer are rewired. The taps are labeled on the transformer. The transmitter is supplied from the factory wired for 115 VAC. In areas where the line voltage deviates more than ±10% from 115 VAC, the use of a line voltage regulator is recommended. This regulator should have a minimum current capability of 3 amps.

DC OPERATION

The T-599A is not designed for 12 VDC operation. However, the transmitter can be used from a 12 VDC source by using an inverter capable of supplying 350 watts or more.

ANTENNA

Any of the common antenna systems designed for use on the high frequency amateur bands may be used with the T-599A, provided the input impedance of the transmission line is not outside the capability of the pi-output matching network. The transmission line should be of the coaxial cable type. An antenna system which shows a standing wave ratio of less than 2:1 when using 50 or 75 ohm coaxial transmission line, or a system that results in a transmission line input impedance that is essentially resistive, and between 15 and 200 ohms will take power from the transmitter with little difficulty. If open-wire or balanced type transmission line is used with the antenna, a suitable antenna tuner is recommended between the transmitter and the feed line. Methods of construction and operating such tuners are described in detail in the ARRL Antenna Handbook, and similar publications. For operation on the 80 and 40 meter bands, a simple dipole antenna, cut to resonance in the most used portion of the band will perform satisfactorily. For operation of the transmitter on the 10, 15, and 20 meter bands, the efficiency of the station will be greatly increased if a good directional rotary antenna is used. Remember that even the most powerful transmitter is useless without a proper antenna.

MICROPHONE

The microphone input is designed for low (600 ohms) or high (50 K ohms) impedance microphones. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transmitter provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat response throughout the speech range.

The microphone manufacturer's instructions should be followed in connecting the microphone cable to the plug. With many microphones, the push-to-talk button must be pressed to make the microphone operative. For VOX operation, this feature may be disabled, if desired, by opening the microphone case and permanently connecting the contacts which control the microphone.

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the T-599A from its shipping box and packing material and examine it for visible damage. If the equipment has been damaged in shipment, save the box and packing material and notify the transportation company immediately. It is a good idea to save the box and packing material in any case because they are very useful for shipping or moving the equipment.

The following accessories should be included with the transmitter:

1 Operating Manual
1 Warranty Card
1 Microphone Plug
1 Alignment Tool
2 Plastic Extension Feet
1 Remote cable (for connection to R-599A)
4 Phono Plugs
1 ANT cable (for connection to R-599A)

2.2 OPERATING LOCATION

As with any solid state electronic equipment the T-599A should be kept free from extremes of heat and humidity. Choose an operating location that is dry and cool, and avoid operating the transmitter in direct sunlight. Also, allow at least 3 inches clearance between the back of the equipment and any object. This space allows an adequate air flow from the ventilating fan to keep the T-599A cool.

2.3 CABLING

GROUND

Connect a wire from a good earth ground to the GROUND stud on the back of the transmitter. If a good earth ground is not available and the T-599A is operated from an approved three-wire electrical system in the United States, the third or neutral wire will normally supply an adequate ground.

ANTENNA

Connect a 50 ohm antenna feedline to the coaxial connector on the rear panel. If a single antenna is desired for the receiver and transmitter use the RX ANT jack to connect the transmitter to the receiver. For its use the ANT cable is presented with the set.

KEY

If CW operation is desired, connect a key to the KEY jack on the back panel.

POWER CORD

Make sure the POWER switch on the front panel of the T-599A is turned off, the stand-by switch is put in the STBY position, and connect the power cord to the power source.

MICROPHONE

Attach the microphone connector to a suitable microphone. Be sure that the PTT switch of the microphone is separate from the microphone circut. Figure 11 shows how to install the microphone connector. The input impedance to the microphone amplifier is 600 ohms or 50 K ohms, depending on the position of the microphone impedance selector switch, found on the bottom of the transmitter. (See Figure 8.)

The microphone circuits were designed under the assumption that microphones with an output impedance of 600 ohms will have a standard sensitivity of −79 dB to −80 dB and those having an impedance of 50 K ohms, a standard sensitivity of −40 dB to −50 dB. Accordingly, the transmitter is operable with a wide variety of microphones. To connect the microphone connector to the microphone, proceed as illustrated in Figure 11, using the connector provided with the transmitter.

REMOTE CABLE

Operation with the R-599A — Connect the REMOTE cable, supplied with the transmitter, to the REMOTE connector on the R-599A. This cable provides all necessary interconnections for station operation.

TABLE 1. REMOTE CONNECTOR

PIN Number	FUNCTION
1	VFO input or output during transceiver operation.
2	Not used.
3	Calibrate signal to R-599A during combined operation.
4	Relay voltage to R-599A during combined operation.
5	Not used.
6	ALC input from a linear amplifier.
7	Not used.
8	Heterodyne oscillator input from R-599A during transceive operation.
9	Ground.
10	Anti-vox input.
11	B+ input to transmitter VFO during transceiver operation when using the transmitter VFO for frequency control.
12, 13, and 14	Pins 12, 13 and 14 are parallel with a single-pole, double-throw contact of the VOX relay. During standby Pin 13 becomes a grounded common contact with Pin 14. During transmit, Pin 13 becomes a grounded common contact with pin 12. Pin 12 is connected to the AMP C. socket.
15	Sidetone output.
16	Ground.

OPERATION WITH ANOTHER RECEIVER

If the T-599A is going to be operated with a receiver other than the R-599A the REMOTE cable will have to be adapted to the particular receiver. Table 1 shows which pins connect which functions. Also see Figure 2.

SECTION 3 OPERATING CONTROLS

3.1 FRONT PANEL CONTROLS

MODE SWITCH (1 on Figure 4)

This switch selects one of the following modes of operation.

TUN — Turn the MODE switch to this position to generate a CW carrier for tuning the transceiver. This position provides reduced screen voltage to the finals to prevent damage during tuning.

CW — This position is used for operating the T-599A in the CW mode.

LSB — This switch position selects the circuits for operating on lower sideband. International amateur practice dictates the use of LSB on the 3.5 and 7 MHz bands.

USB — This switch position selects the circuits for operating on upper sideband. International amateur practice dictates the use of USB on the 14, 21 and 28 MHz bands.

AM — This switch position selects the circuits for operating in the AM mode.

METER SWITCH (2 on Figure 4)

The position of the METER switch determines the function of the meter. The switch selects one of the following functions:

ALC (Automatic Level Control) — In this position the meter monitors the ALC voltage of the internal ALC circuit (or the ALC voltage feedback from a linear amplifier operated in conjunction with the T-599A). For SSB operation the ALC reading for voice peaks should be within the indicated ALC segment of the meter.

IP (Plate Current) — In this position the meter monitors the plate current of the final tubes. The meter scale is calibrated from 0 to 300 ma.

RF (Output Power) — In this position the meter monitors relative output power of the transceiver. There is no meter scale for this position.

HV (High Voltage) — In this position the meter monitors the high voltage from the power supply. The meter scale is calibrated from 0 to 10, indicating 0 to 1,000 volts.

MIC CONNECTOR (3 on Figure 4)

The microphone connector is four pronged, allowing use of a PTT microphone. Figure 11 shows how to wire the plug on the microphone cable.

FUNCTION SWITCH (4 on Figure 4)

This 3-position rotary switch selects one of the following functions.

MAN — In this position, the transmitter is switched to transmit by the PTT switch of the microphone, or by switching the standby switch to SEND.

CAL — With the switch in this position the T-599A generates a low power signal which is used to calibrate the trnasmitter to the R-599A's receive frequency.

VOX — In this position the T-599A is switched into transmit by the VOX circuits when the operator speaks into the microphone.

MAIN TUNING KNOB (5 on Figure 4)

This control turns the VFO and dial scale to select the frequency to be added to the band frequency to establish the transmitter's operating frequency.

DIAL SCALE (6 on Figure 4)

The dial scale provides a direct frequency readout, calibrated to 1 kHz. The frequency displayed on the dial scale, when added to the base frequency of the chosen band and the frequency shown on the sub dial, shows the exact operating frequency of the transmitter. One revolution of the dial scale is 100 kHz.

SUB-DIAL (7 on Figure 4)

The sub-dial is turned with the main tuning knob to select the operating frequency of the transmitter. It is calibrated at 25 kHz intervals from 0 — 600 kHz. The operating frequency of the T-599A is determined by adding the frequency shown on the BAND switch, this sub-dial, and the dial scale.

DIAL POINTERS (8 on Figure 4)

These pointers serve as the reference for reading the operating frequency from the dial scale. Choose the correct pointer for the mode used. The side pointers are used for sideband, and the center pointer is used for AM and CW.

BAND SWITCH (9 on Figure 4)

This 7-position rotary switch selects all the necessary circuits to tune the transmitter to the desired 600 kHz band.

POWER SWITCH (10 on Figure 4)

The POWER switch turns all power on and off in the T-599A.

STAND-BY SWITCH (11 on Figure 4)

This two position lever switch selects one of the following functions.

STBY — With the switch in this position the transmitter is in standby, not transmitting. If the function switch is set to VOX the T-599A will be switched to transmit by the operator's voice. If the FUNCTION switch is set to MAN the transmitter is switched by the PTT switch on the microphone.

SEND — The T-599A is locked into the transmit mode in this switch position.

DRIVE CONTROL (12 on Figure 4)

The DRIVE tuning control tunes the 12BY7A driver, the antenna mixer circuits, and the ganged circuits of the PA driver.

PLATE CONTROL (13 on Figure 4)

The PLATE tuning control is the smaller diameter knob extending farthest from the panel. This control adjusts the plate tuning of the two S2001 final tubes.

LOAD CONTROL (14 on Figure 4)

The LOAD control, the outside ring, adjusts the loading of the pi-circuit of the transmitter. The front panel scale

shows relative impedance. The impedance increases as the control is turned clockwise.

CAR LEVEL CONTROL (15 on Figure 4)

This control turns a variable resistor that adjusts the output carrier level during CW or AM operation.

MIC GAIN CONTROL (16 on Figure 4)

The MIC GAIN control adjusts the gain of the microphone amplifier for phone operation.

VFO LIGHT (17 on Figure 4)

This light illuminates to show which VFO (the transmitter's or receiver's) is controlling operation. When the transmitter is used without the R-599A the T-599A's VFO will be controlling the frequency.

METER (18 on Figure 4)

The meter monitors four different functions, depending on the position of the METER switch as described in the section on the METER SWITCH.

3.2 REAR PANEL CONTROLS

RX ANT JACK (1 an Figure 5)

Use this RCA phone jack to connect the T-599A's antenna to a receiver to provide antenna input to the receiver when using one antenna for receiver and transmit functions.

ANT CONNECTOR (2 on Figure 5)

This SO-239 coax connector should be attached to a suitable antenna, dummy load, or amplifier, for transmitting and receiving or transmitting only. The antenna impedance should be 50 ohms unbalanced.

GND (Ground) LUG (3 on Figure 5)

To prevent accidental shocks from the chassis, connect a good earth ground to this lug.

POWER CORD (4 on Figure 5)

Use this 2 conductor cord to attach the transmitter to a suitable power source.

EXT AC (5 on Figure 5)

This socket provides 115 VAC at about 300 watts, to supply power for a receiver or another accessory being used with the transmitter. The socket is not switched by the POWER switch, but is on at all times.

ALC JACK (6 on Figure 5)

When the T-599A is used with a linear amplifier which has provisions for ALC output, connect the output from the amplifier to this jack.

AMP CONT JACK (7 on Figure 5)

This jack is connected to a relay in the T-599A for controlling a linear amplifier or an external receiver. This relay contact is normally open during receive and shorted during transmit.

REMOTE CONNECTOR (8 on Figure 5)

This 16-pin connector controls all of the input, output, and switching functions when the R-599A is used with the T-599A. With the SEP/TRCV switch in the TRCV position and the R-599A attached through this connector, all switching functions are controlled by the R-599A. The connector can also supply relay contacts for controlling other receivers or amplifiers. See Table 1.

FUSE (9 on Figure 5)

This fuse is a 3AG, 6 amp fuse which protects the power supply of the transmitter against short circuits. Never use a higher amperage fuse than the one specified. An improper one can cause extensive damage to the transmitter.

COOLING FAN (10 on Figure 5)

This four-vaned fan cools the RF amplifier section of the T-599A. The POWER switch turns the fan on and off.

KEY JACK (11 on Figure 5)

Connect a key to the jack for CW operation.

SEP/TRCV SWITCH (12 on Figure 5)

The VFO slide switch selects between the internal (SEP) VFO of the T-599A and an external VFO of the R-599A. For normal operation, without an external VFO, set the switch to SEP. If the switch is set to TRCV, and no remote VFO is attached, the internal VFO will not operate. When used with the R-599A, set the switch to TRCV.

TRANSVERTER SWITCH (13 on Figure 5)

When this slide switch is in the ON position the PA section is disabled and the output is link coupled to the TRANSVERTER OUT connector. This feature allows use of the T-599A with an accessory transverter.

TRANSVERTER OUT CONNECTOR (14 on Figure 5)

This connector is used in conjunction with the TRANSVERTER switch, as described above.

3.3 INTERNAL CONTROLS

VOX CONTROL (1 on Figure 6)

This control adjusts the sensitivity of the VOX circuit by adjusting the gain of the VOX amplifier. This control usually needs to be adjusted to the voice of the operator.

ANTI-VOX CONTROL (2 on Figure 6)

This control adjusts the level of the anti-vox signal fed into the VOX circuit. Adjust the control to prevent feedback from the speaker from tripping the VOX circuit.

DELAY CONTROL (3 on Figure 6)

This control adjusts the delay of the VOX circuit. Turn it to keep the VOX from holding too long between words or from tripping between words. The position depends on the preference of the operator.

BIAS CONTROL (4 on Figure 6)

The BIAS control adjusts the bias voltage of the two final tubes. Turning the control clockwise increases the idling plate current of the tubes. Section 4.3 describes proper adjustment of the bias current.

SIDETONE (VR1 on the Sidetone Board — X54-0020-00)

This control adjusts the gain of the sidetone signal that is fed to the receiver through the REMOTE connector. Adjust it for the desired volume for monitoring CW operation.

3.4 BOTTOM CHASSIS CONTROL

MICROPHONE IMPEDANCE SWITCH (S5 on Figure 8)

This slide switch selects either a 600 ohm or a 50 K ohm input impedance to the microphone amplifier. Select the correct impedance for the microphone used.

SECTION 4 OPERATING INSTRUCTIONS

4.1 BEGINNING PROCEDURE

Set the MIC GAIN control fully counterclockwise and the MODE switch to LSB, USB, or CW to prevent accidental transmit conditions before tuning. The T-599A must be operated into a 50 ohm antenna or dummy load with an SWR less than 2:1. Random length wire antennas or light-bulb dummy loads cannot be used. Conventional half-wave dipoles and beam antennas should only be used at or near their resonant frequency. Exceeding an SWR of 2:1 can damage the components in the output stage of the transmitter.

Be sure to complete all of the required cabling, as described in Section 2.3.

4.2 CALIBRATION

READING THE OPERATING FREQUENCY

The operating frequency of the T-599A is the sum of three different reading — the base frequency of the band (3.5, 7.0, . . .), the reading of the sub-dial (0, 100, 200, . . .) and the reading of the dial scale (0, 10, 20, . . .).

The sub-dial is calibrated in 25 kHz intervals from 0 to 600. The dial scale is calibrated in kHz intervals from 0 to 100. About four revolution of the main tuning knob turns the dial scale once, covering 100 kHz. Six turns of the dial scale covers the entire band from 0 to 600 kHz.

Example: BAND Switch — 14.0
Sub-dial — Between 200 and 300
Dial Scale — 80
Operating Frequency — 14.0 MHz + 200 kHz + 80 kHz = 14.280 MHz

CALIBRATING THE TRANSMITTER TO THE RECEIVE FREQUENCY

When the T-599A is used with the R-599A, the station has a built-in 25 kHz crystal calibrator. Set the FUNCTION switch on the T-599A to CAL. With the switch in this position the transmitter generates a low-power signal through pin 3 of the REMOTE connector to the receiver.

Calibrate the R-599A (or another receiver) as described in the receiver's manual. Then tune in the T-599A's signal by tuning the transmitter's VFO to zero-beat the transmitted signal on the receiver. If the dial scale on the transmitter does not read the same frequency as the receiver, the dial scale requires recalibrating.

To recalibrate the dial scale, hold the main tuning knob with one hand and turn the dial scale with the other until the center dial pointer points to the same frequency to which the receiver is tuned.

DIAL POINTER

When the T-599A is correctly calibrated, as described above, the center dial pointer shows the operating frequency for AM and CW. The left dial pointer shows the operating frequency for LSB operation and the right dial pointer shows the operating frequency for USB operation.

4.3 TRANSMITTER TUNING

Connect the T-599A to a 50 ohm dummy load or a 50 ohm antenna with an SWR of less than 2:1 before making any transmitter adjustments. The life of the final tubes depends on the SWR of the antenna and to the length of tuning periods.

Refer to Table 2 for the initial switch settings of the T-599A for transmitting. Tune the main tuning knob to the desired operating frequency.

Flip the POWER switch to ON. If the T-599A is operating properly the meter and dial lights will come on. The driver and final tubes require two or three minutes to warm up.

When the tubes have warmed up, turn the MODE switch to TUN, flip the standby switch to SEND, and adjust the DRIVE control for a maximum ALC reading on the meter. This procedure adjusts the final PA SECTION for resonance

TABLE 2. INITIAL SWITCH SETTINGS FOR TRANSMISSION

LOCATION	CONTROL	POSITION
FRONT PANEL CONTROLS	POWER Switch	OFF
	FUNCTION Switch	MAN
	BAND Switch	Desired Band
	STBY/SEND Switch	STBY
	MODE Switch	USB or LSB depending on the band
	METER Switch	ALC
	PLATE Control	Middle of range for the band
	LOAD Control	Center Scale
	DRIVE Control	Center Scale
	MIC GAIN Control	Fully counter-clockwise
	CAR LEVEL	Fully counter-clockwise
REAR PANEL CONTROLS	SEP/TRCV Switch	SEP (or TRCV if used with the R-599A)
	TRANSVERTER Switch	OFF

before power is applied to the final tubes. Put the standby switch back to STBY and the MODE switch back to USB or LSB.

NOTE:

When operating on any of the 28 MHz bands, the transmitter may not show any ALC reading in the TUN position. If necessary, turn the METER switch to IP and the MODE switch to CW. Adjust the DRIVE control for maximum plate current and then quickly adjust the PLATE control for minimum plate current. Then proceed with the tune-up.

PLATE IDLING CURRENT

Turn the main tuning knob to the desired operating frequency within the amateur band selected, turn the METER switch to IP, and set the MODE switch to USB or LSB. Flip the stand-by switch to SEND and check that the plate current (IP) is 60 ma. If the plate current is not correct, adjust the internal BIAS control for a correct 60 ma of idling current and return the stand-by switch to STBY.

CAUTION

If the plate current is very much higher than 60 ma do not leave the stand-by switch on for more than a few seconds. Excessive plate current shortens the life of the final tubes.

PLATE TUNING

After adjusting the idling current, shift the MODE switch to CW and the stand-by switch to SEND. Quickly adjust the PLATE control to dip the plate current (a minimum meter reading).

CAUTION

When the mode switch is in the CW position the final tubes draw full plate current in transmit. Final tube life is directly related to the length of tune-up periods. Do not transmit with the tubes out of resonance for more than 10 seconds at a time.

The dip should occur with the PLATE control within the range for the selected band (as shown on the front panel).

PLATE AND LOAD TUNING

With the MODE switch at CW, turn the METER switch to RF, and keep the stand-by switch in the SEND position. Quickly adjust the PLATE control and then the LOAD control alternately to peak (maximum meter deflection) the power output.

4.4 SSB OPERATION

PTT OPERATION

Tune the T-599A as described in Sections 4.1 to 4.3. Set the mode switch to USB or LSB and connect a microphone to the MIC connector.

NOTE:

International amateur practice dictates using USB or LSB on the following bands.

3.5 MHz Band	LSB
7.0 MHz Band	LSB
14.0 MHz Band	USB
21.0 MHz Band	USB
28.0 MHz Band	USB

Key the transmitter and speak into the microphone with the tone of voice used in normal operation. Adjust the MIC GAIN control until voice peaks are about half-scale on the ALC range printed on the meter scale. The METER Switch is in the ALC position. If the transmitter is driven beyond this range, the transmitted signal will be distorted.

VOX OPERATION

Adjust the transceiver as described in the previous paragraph. Flip the FUNCTION switch to VOX and close-talk into the microphone, increasing the VOX gain control (inside the T-599A) until the VOX relay just operates. For VOX operation it is desirable to close-talk the microphone to prevent background noises from tripping the T-599A into transmission.

TABLE 3. SUMMARY OF TRANSMITTER TUNING PROCEDURES.

MODE Switch	METER Switch	Stand-by Switch	Procedure
TUN	ALC	SEND	Peak the ALC reading with the DRIVE control.
USB or LSB	Ip	SEND	Adjust the BIAS control for 60 ma.
CW	Ip	SEND	Dip plate current with PLATE control then peak plate current with DRIVE conrtol.
CW	RF	SEND	Alternately peak RF output by adjusting the PLATE and LOAD controls.

Check that the ALC reading for voice peaks is still within the ALC range on the meter. If necessary, adjust the MIC GAIN for a proper ALC reading.

If the VOX circuit is activated by speaker noise, adjust the ANTI VOX control inside the transmitter. Increase the control as necessary for proper VOX operation.

Do not use more VOX gain or more ANTI VOX gain than necessary to control VOX operation. If the VOX circuit transfers between words, or holds too long, adjust the release time constant by turning the delay control inside the transmitter.

4.5 CW OPERATION

Tune and load the T-599A as described in Sections 4.1 through 4.3. Connect a key to the back panel KEY jack, set the MODE switch to CW, and set the stand-by switch to SEND for transmitting.

CW transmissions are automatically monitored through the speaker of the receiver when the T-599A is used with the R-599A. The audio gain of the sidetone can be adjusted with VR1 on the sidetone board, X54-0002-00.

For semi-break-in operation, set the FUNCTION switch to VOX and the stand-by switch to STBY. Hold the key down and increase the VOX GAIN control inside the transmitter until the VOX relay just operates. If it is desired to change the release time constant of the VOX circuit, adjust the DELAY control inside the transmitter. Reduce the ANTI-VOX as necessary.

The plate current for CW operation should be about 200 ma. Use the CAR LEVEL control to adjust the carrier level for CW operation to about 200 ma of plate current.

4.6 AM OPERATION

Tune and load the T-599A as described in Section 4.1 through 4.3. Turn the MODE switch to AM and the METER switch to IP. Flip the stand-by switch to SEND and adjust the CAR LEVEL control for an IP meter reading of about 120 ma.

Set the METER switch to ALC and adjust the MIC GAIN control until the meter just moves. Then decrease the MIC GAIN control until the meter shows no movement. The T-599A is now properly adjusted for AM operation.

4.7 OPERATION WITH A LINEAR AMPLIFIER (See Figure 3)

Tune and load the T-599A as described in Sections 4.1 through 4.3 and adjust it for the selected mode. See the instruction manual of the amplifier to determine whether the linear requires a contact which is normally open (in stand-by) or normally closed to ground (in stand-by).

The AMP CONT jack on the T-599A is normally open. If the amplifier requires that kind of a contact, simply connect the AMP CONT jacks of the transmitter to the relay control jack of the amplifier.

If the amplifier requires a normally closed contact, the operator will have to use pins 12 and 13 of the REMOTE connector to control the linear. 12 and 13 are normally closed to ground in stand-by. Pins 13 and 14 are an additional normally open contact.

If the amplifier has provisions for ALC, connect the ALC output of the amplifier to the ALC jack on the transmitter. The ALC feedback from the amplifier should prevent the T-599A from overdriving the linear for SSB operation.

4.8 OPERATION WITH A RECEIVER

R-599A

To operate the T-599A with the R-599A, simply connect the REMOTE cable between the two pieces of equipment. In this configuration the REMOTE cord performs all of the required switching and control functions. When the equipment is connected in this manner, the VFO select switch of the R-599A controls the function of each VFO.

To use the cross operation feature, the rear panel SEP/TRCV switch must be in the TRCV position.

ANOTHER RECEIVER (See Figure 2)

To operate the T-599A with another receiver, connect the mute connector of the receiver (see the instruction manual of the receiver) to the appropriate relay contact (normally open, pins 13 and 14, or normally closed, pins 12 and 13) on the REMOTE connector (pin 13 is ground). Also connect an antenna lead from the RX ANT jack of the transmitter to the receiver's antenna connector. Table 1 shows the function of each pin in the REMOTE connector.

4.9 CHANGING THE BAND COVERAGE

The T-599A is supplied for amateur band use. However, in cases where the owner is willing to sacrifice one or more of the standard frequency ranges, he can substitute an adjacent special range by changing the appropriate high frequency crystal.

The transition is easiest on the 10 meter band because there are three frequency ranges. For special frequency coverage above or below the amateur bands, such as MARS frequencies or others, you can achieve coverage by replacing the appropriate HF crystal.

An exception to this rule is frequencies above 30 or

R-599A VFO SELECT Switch	Transmitting VFO	Receiving VFO
NORMAL	T-599A	R-599A
RX	R-599A	R-599A
TX	T-599A	T-599A
REVERSE	R-599A	T-599A

below 3.5 MHz or near the IF frequency. These ranges are outside of the basic tuning capabilities of the transmitter. You should remember however that the farther away from the amateur bands the more out of resonance you become. In transmit you lose power output. Also on transmit if you are too far from the standard band you will begin to burn out components. Return the transmitter coils for the new frequency as described in Section 6.6.
The band crystals for the T-599A are as follows:

X1 for 3.5 MHz is 12.395 MHz
X2 for 7.0 MHz is 15.895 MHz
X3 for 14.0 MHz is 22.895 MHz
X4 for 21.0 MHz is 29.895 MHz
X5 for 28.0 MHz is 36.895 MHz
X6 for 28.5 MHz is 37.395 MHz
X7 for 29.1 MHz is 37.995 MHz

The band coverage will change exactly the same amount as the band crystal is changed. For example if you replace X2 by a 15.395 crystal the 40 meter band position will cover 6.5 to 7.0 MHz (500 kHz below). Or if you replace X5 by a 35.695 crystal your coverage on the lower 10 meter band would be from 26.8 to 27.4 instead of 28.0 to 28.5. You change the band crystal exactly the amount you wish to change the band coverage and in the same direction. Be sure and choose the amateur band closest to the operating frequency you wish. When the T-599A is used with the R-599A, the amateur band can be retained in one unit and other unit can be converted, giving both ranges with transceive operation.

4.10 SSTV OPERATION

The T-599A will adapt very well to slow scan television operation. The only cabling required is a connector between the MIC connector of the T-599A and the output of the television console.

Be careful to keep the input power of the transmitter down to a safe level with the MIC GAIN control. If you exceed the plate power dissipation capability of the tubes, they will be damaged.

4.11 NOVICE OPERATION

The Kenwood T-599A offers the unique opportunity to the beginning amateur of buying a top quality ham rig which adapts to novice operation at very little cost. So the initial equipment investment is good for whatever level of license the operator advances to.

For the novice to operate the Kenwood within the legal power limitations, all he has to do is remove one of the final tubes from the final RF section. Alternately, adjust the car level control to keep the plate input power below 75 watts (approximately 90 ma). Adjusting the carrier level yields much less power output because it reduces the efficiency of the tubes.

SECTION 5 CIRCUIT DESCRIPTION

5.1 GENERAL DESCRIPTION

(Refer to the block diagram, Figure 13 page 23)

The T-599A is a high frequency SSB, AM, or CW transmitter that provides full coverage of all amateur bands between 3.5 MHz and 29.7 MHz. Employing printed circuit construction and solid state components (with the exception of the driver and power amplifier), a significant reduction in the physical size has been achieved with increased reliability and uniform performance.

All boards of the T-599A transmitter are marked with their identification numbers which are used not only in the text of this manual, but in the block and schematic diagram as well. Refer to the schematic diagram, Figure 14, page 25, for circuit analysis.

5.2 MICROPHONE AMPLIFIER (X52-0009-00)

The AF signal from the microphone amplifier is applied to the MIC input terminal of X52-0009-00 through a two-position input impedance selector switch, which selects either 600 ohms or 50 Kohms input impedance. The signal is then coupled to the microphone amplifier, which is comprised of Q1, Q2, and Q3.

Initial stage amplifier Q1, also functioning as a VOX amplifier, provides a gain of approximately 25 dB. The output of amplifier Q1 is directly coupled through the microphone gain control to the second and third stage amplifiers Q2 and Q3.

The second and third stage amplifiers each use output-to-input negative feedback which provides not only high gain with a minimum of distortion, but also reduces the output impedance, thereby matching the output to the balanced modulator.

5.3 BALANCED MODULATOR (X52-0009-00)

During SSB operation, the audio signal, from microphone amplifier Q3, and the RF signal of 3393.5 or 3396.5 (depending on the sideband selected) are coupled to the ring balanced modulator consisting of diodes D1 through D4. AF to RF translation is accomplished and the output, a double sideband suppressed carrier signal, is directly coupled to the input of crystal filter XF1.

For the AM or CW mode of operation a DC voltage is applied to the balanced modulator, switching it to an unbalanced condition. This allows the AM or CW carrier frequency of 3395.0 kHz to pass through the balanced modulator to the crystal filter. The amplitude of the carrier to be supplied is controlled by the CAR LEVEL control on the front panel of the set.

5.4 CARRIER OSCILLATOR (X50-0002-00)

The carrier oscillator frequencies are 3393.5 kHz for LSB, 3396.5 kHz for USB and 3395.0 kHz for AM or CW transmission.

Oscillator transistor Q1 is operated in a Pierce configuration, with diodes D1 through D4 inserted in series with the USB, CW, or AM crystal respectively. The oscillator frequency is selected by application of a forward bias to these diodes.

When not switched on, these diodes present a high resistance to ground, opening the oscillator circuit. Application of a forward bias causes the diodes to go into conduction, lowering their resistance to approximately 10 ohms. This completes the oscillator circuit to ground, allowing oscillator Q1 to start in oscillation. Trimmer capacitors connected in parallel with the crystals provide a means of fine adjustment to the oscillator frequency.

The output of oscillator Q1 is coupled through a capacitive voltage divider, formed by capacitors C11 and C13, to the base of emitter follower Q2. The emitter follower configuration of Q2 presents a low output impedance (approximately 100 ohms), minimizing the fluctuation of oscillator output voltage and frequency due to load variation.

5.5 FILTER AND IF AMPLIFIER (X52-0009-00)

During SSB operation, upper and lower sideband information from the balanced modulator is applied to crystal filter XF1. The pass band of XF1 is centered on 3395.0 kHz, and passes either the LSB signal of 3393.5 kHz or the USB signal of 3396.5 kHz, depending upon the sideband selected.

The selected sideband is then applied to integrated circuit (IC) amplifier Q4 (TA7045M) which has a circuit configuration as shown in Figure 12. Transistors Q1 and Q2 form a differential pair and Q3 is a constant current source. Operating in this arrangement they provide a high gain amplifier that is virtually insensitive to temperature and voltage changes.

During SSB or CW operation, ALC voltage is applied to the base of the emitter follower Q6, effectively varying its conduction. The varying output of Q6 is coupled through resistor R23 to the base of the differential amplifier, Q1 and Q2, increasing or decreasing their gain. This provides a constant signal to the final amplifiers, assuring a high level of output power without excessive distortion at the peaks.

When operating in the AM mode, the RF carrier frequency of 3395.0 kHz is applied through crystal filter XF1 to the base of Q1 of the differential pair. The modulating signal is coupled from the output of microphone amplifier Q3, through the emitter follower Q6, to the base of Q1 and Q2 of the differential pair.

Algebraic addition of the AF and RF signal takes place in the common emitter source, Q1 and Q2. This amplitude modulated RF signal is then coupled through transformer T2 and the 1st mixer Q5.

5.6 1st MIXER & BAND PASS FILTER (X52-0009-00)

The IF signal from TA7045M (IF amplifier Q4) is coupled to the 1st mixer Q5, where it is heterodyned with the output signal of the VFO operating in the frequency range of 5.5 to 4.9 MHz. This produces the 2nd IF signal between 8.895 and 8.295 MHz.

Mixer Q5, a field effect transistor, provides a wide

square E_G-I_D characteristic curve which makes it particularly suitable for a mixer.

VFO isolation is provided by the emitter follower Q7, and prevents the transmitter and receiver circuits from interfering with each other when the T-599A is operated with its companion receiver R-599A in the transceive mode.

The AM, CW, or SSB signal in the range of 8.295 to 8.895 MHz is coupled to the band pass-filter (BPF). The filter consists of three tuned LC circuits with a center frequency of 8.595 kHz and is essentially flat (within ±1 dB) for 300 kHz on each side of center.

It rejects spurious signals outside its bandpass and the output is delivered to the 2nd mixer (X47-0004-00).

5.7 VFO SECTION (X40-0016-08)

The variable frequency oscillator operates in the frequency range of 4.9 to 5.5 MHz. The circuit is composed of a field effect transistor (FET) operating in a Clapp configuration followed by three buffer stages each employing FET.

The output from the buffer stages is coupled through a harmonic filter to an output stage, consisting of two transistors connected in a Darlington configuration and acting as a low impedance buffer.

The VFO section is completely enclosed and factory adjusted. It should never be removed from its case or modified in any way.

5.8 2nd MIXER (X47-0004-00, X40-0018-00)

The output of the bandpass filter is coupled to the 2nd mixer, where it is mixed with the output of the heterodyne crystal oscillator of the selected band. This mixer operates in the subtractive mode, therefore the output frequency is the difference between the two input frequencies.

The plate tuning circuit (X40-0018-00) is composed of a variable capacitor and a fixed coil, parallel resonant to 3.5 MHz. Band switching for the 7, 14, 21, and 28 MHz bands is accomplished by connecting the coil of the selected band in parallel with the basic 3.5 MHz resonant circuit. This effectively decreases the total inductance of the circuit, increasing the resonant frequency.

5.9 HETERODYNE CRYSTAL OSCILLATOR (X47-0004-00, X40-0019-00)

Transistor Q2 and its associated crystal form a 3rd overtone crystal oscillator. The crystals and tuning coil are mounted on a separate board (X40-0019-00), so designed that the appropriate circuit is automatically selected by the band switch for the band in use.

Because of the large bandwidth of the 10 meter band, individual coil and crystal combinations are used to cover the band segments of 28.0, 28.5 and 29.1 MHz respectively. This assures uniform performance over the entire band.

During separate operation, the DPDT SEP/TRCV switch places a ground on the emitter of Q2 and the base of Q3. Under these conditions, input amplifier Q3 is cut off and oscillator Q2 supplies the injection voltage for the 2nd mixer.

When the transceive mode of operation is selected, the output of the R-599A receiver heterodyne oscillator is applied to the base of input amplifier Q3 through one contact of the DPDT SEP/TRCV switch.

The other contact of the switch breaks the ground to the emitter of Q2, grounding the emitter of Q3 and the cathode of diode D1. The injection signal for the 2nd mixer is now taken from input amplifier Q3. Application of ground to diode D1 cause it to be forward biased by the pullup action of R2 to the 9 volt source; this grounds the base of Q2, insuring its inactivity.

5.10 DRIVER AMPLIFIER (X47-0004-00, X40-0017-00)

The output of the 2nd mixer is capacity coupled to the grid of the driver amplifier V1. Operating as a class A amplifier, this stage provides sufficient gain to drive the parallel class AB1 final amplifier, V2 and V3.

The plate tuning circuit is identical to that of the 2nd mixer with the exception of a link coupling added to the 3.5 MHz coil. This derives an output sufficient to drive a VHF transverter or similar device requiring a low level driving signal.

Turning the TRANSVERTER switch to ON connects the link coil to the transverter output connector and applies a negative voltage to the screen grid of the final amplifier tubes causing them to cut off.

5.11 POWER AMPLIFIER STAGE

The power amplifier stage consists of two S2001 beam power tubes connected in parallel and operated in class AB1 with a rated power input of 200 watts PEP. Neutralization of this stage assures optimum stability for operation on all bands.

Output from the parallel power amplifier is tuned by a pi-network and coupled to the antenna through contacts of the TX/RX relay, RL2.

5.12 ALC & BIAS CONTROL (X53-1030-10)

This board controls the operating and blocking bias to the 1st mixer, 2nd mixer, driver and power amplifier for the AM, CW, and SSB mode of operation.

During the SSB or AM mode of operation, the junction of resistor R1 and diode D1 is grounded by the MODE switch. This removes the blocking bias from the driver (terminal DG) and the 1st and 2nd mixer (terminal MG).

Under standby conditions, terminal RS is grounded through contacts of the VOX relay. This establishes a bias on the base of transistor Q1, turning it on, which places −94 volts on terminal PG through diode D2 and variable resistor VR1. This negative voltage keeps power amplifier, V2 and V3 in a cutoff condition.

Activation of the VOX relay by voice signal or with a manual switch removes the ground from terminal RS, removing the bias from the base of Q1, turning it off. Operating bias of about −50 volts (derived through terminal PG, from the −94 volts source, and voltage divider network RS, RG, and VRS) is now applied to the power amplifier.

When the CW mode of operation is selected and the transmitter is in standby, the ground from the junction of resistor R1 and diode D1 is removed. Blocking bias is now developed across voltage divider R1, R9 and R10 and applied to terminal DG and MG, biasing the first mixer, 2nd mixer and driver stage into cutoff. Terminal RS is grounded through contacts of the VOX relay which turns on transistor Q1 and applies −94 volts bias to the power amplifier through terminal PG, cutting them off.

Closing the key grounds the junction of resistor R1 and diode D1 and activates the VOX relay. The ground at the junction of R1 and D1 removes the blocking bias to the 1st mixer, 2nd mixer, and driver through terminal DG and MG. Activation of the VOX relay removes the ground at terminal RS which cuts off transistor Q1 and applies operating bias to the power amplifier through voltage divider R5, R6 and VR5.

This form of block bias keying assures smooth CW operation without backwave radiation.

Transistor Q2 functions are an ALC amplifier during CW and SSB operation. When the power amplifier is driven into grid current region, a voltage change is felt across variable resistor VR1; this change is detected and amplified by transistor Q2 and applied to the ALC terminal of the board where it is coupled to IF amplifier Q4, effectively controlling the gain of the IF stage.

This circuit has a fast attack time and a slow release time assuring optimum drive to the power amplifier at all times without excessive distortion.

5.13 POWER SUPPLY CIRCUIT (X43-0011-00 and chassis)

Operating voltages for the transmitter are derived from a single transformer with multiple secondary windings. The power supply delivers the following voltages:

B+ 850 VDC Low Voltage B+ 210 VDC and 300 VDC
Bias −90 VDC Low Voltage +14 VDC

The power supply operates from 115 V AC, 50 or 60 Hz and is protected against overload by a 6 amp fused primary. Television interference is reduced by the use of an internal brute force AC line filter.

5.14 AUTOMATIC VOLTAGE REGULATOR (AVR) (X43-0010-00)

The AVR board supplies power to the VFO, carrier oscillator, heterodyne oscillator and other circuits of the transmitter that require a stable low voltage source. Precision regulation of the +9 volts supply (Derived from +14 V DC supply) is obtained by the use of an error detection circuit, an error amplifier circuit and a series regulator. Detailed circuit analysis is as follows:

Transistor Q3 and Q4 comprise a differential amplifier. Transistor Q2 is the error amplifier and transistor Q1 is the series regulator. The reference voltage for the differential amplifier is established by resistor R9 and D1, a 6.6 volts zener diode. The emitter voltage of Q4 follows its base vlotage (less the base-emitter drop of approximately 0.6 volts) and places the emitter of Q3 approximately 0.2 volts negative with respect to the base. Under these conditions error amplifier Q2 and series regulator Q1 are quiescent and the output voltage is stabilized at +9 volts.

Should the output voltage (sensed at the base of transistor Q3) decrease, the collector current will also decrease causing an increase in collector voltage. The increase in Q3 collector voltage is directly coupled to the base of error amplifier Q2; this increasing positive potential on the base causes the collector current to increase, decreasing the collector voltage. The decrease in collector voltage of Q2 is felt on the base of series regulator Q1, a silicon PNP transistor. The decreasé in base voltage causes an increase in current through Q1, decreasing the collector-to-emitter voltage drop, stabilizing the output voltage at +9 volts.

5.15 VOX AMPLIFIER & ANTIVOX CIRCUIT (X54-0001-00)

VOX AMPLIFIER

Under standby condition this circuit is quiescent transistors Q4, Q5, Q7 and Q8 are turned off and transistor Q1 is turned on. VOX amplifier holding capacitor C10 is charged from the +9 volts supply through the VOX delay resistor, VR8.

The output of amplifier Q3 is rectified by half-wave rectifier D6 and produces a −DC output voltage proportional to the AF input to Q3. Application of an AF signal to Q3, and subsequent rectification by D6, forward biases Q4 turning it on. With Q4 on, the base potential of Q5 is lowered, turning it on and allowing the VOX amplifier holding capacitor C10 to discharge through the low collector-to-emitter resistance of Q5.

Since the discharge current of C10 is hFE times as large as the base current of Q5, capacitor C10 will completely discharge through Q5 with the slightest amount of current flow through the collector of Q4. For this reason, the time constant circuit is capable of providing an almost constant VOX hold time for a variable level at the input.

ANTIVOX CIRCUIT

The ANTIVOX signal is coupled through step-up transformer T1 to a full-wave bridge rectifier comprised of diodes D1 through D4. The positive DC voltage from the rectifier circuit is applied to the base of Q1, turning off the transistor.

When transistor Q1 turns off, the increase in collector voltage is coupled through diode D2 to the base of Q2, turning it on, simultaneously charging time-constant capacitor C5. With Q2 turned on, a ground is placed on the base of transistor Q4 of the VOX circuit, preventing the VOX circuit from being activated by extraneous noise.

5.16 SIDE TONE OSCILLATOR (X54-0002-00)

The side tone oscillator activates the VOX amplifier for semi-break-in keying and provides monitoring facilities during CW operation.

The circuit consists of transistors Q1, Q2, Q3 and Q4. Transistor Q1 is a phase shift oscillator operating at approximately 750 Hz. Transistor Q2 and complementary pair Q3 and Q4 provide sufficient amplification to operate an 8 ohm speaker. The output power is approximately 100 mW.

Insertion of the key in the key jack forward biases oscillator Q1, activating it for subsequent CW operation.

The CW sidetone volume and VOX actuating signal is controlled by VR1, located just inside the top cover on X54-0002-00. This position is shown in Figure 6. The transmitter will not function in semiautomatic CW mode unless VR1 is advanced sufficiently clockwise.

5.17 VFO INDICATOR (X53-1030-10)

This lamp shows the operator which VFO is controlling operation when the transmitter is combined with the R-599A for transceive operation.

The lamp (PL4) is turned on by Q3 when this switching transistor is activated by the +9 volts VFO power supply. This +9 volts is supplied through terminal VB on board X53-1030-10.

SECTION 6 MAINTENANCE AND ADJUSTMENT

6.1 GENERAL INFORMATION

This section describes alignment, neutralization, and a few troubleshooting procedures. When removing any of the solid state components, be sure to use a good heat sink to prevent heat damage.

To remove the transmitter from its cabinet, remove the four screws on the top and the three screws on each side. Then lift the cabinet up and away from the chassis.

Seven screws hold the bottom plate on to the chassis. It is not necessary to remove the feet from the bottom plate.

6.2 CARRIER OSCILLATOR

This procedure requires a frequency counter (or another accurate frequency measuring device) and an RF VTVM. In the absence of this test equipment, use a receiver tuned to 3.3935 MHz to make an approximate adjustment.

Couple a frequency counter, or receiver, to the OUT terminal of board X50-0002-00. The frequency should be 3.3935 MHz. Turn the MODE switch to LSB and adjust the core of T1 clockwise until oscillation just stops. Turn the core back (counterclockwise) until oscillation just starts. Check that the oscillator operates in the USB and CW modes as well.

6.3 CARRIER BALANCE

Connect the T-599A to a dummy load and tune the transmitter for CW operation on the 7 MHz or 14 MHz band. Adjust the CAR LEVEL control for an IP meter reading of 200 ma.

Set the MODE switch to LSB and turn the MIC GAIN control fully counterclockwise. Adjust TC1 and VR1 (on X52-0009-00) for a minimum plate current reading.

6.4 GENERATOR BOARD

Tune the T-599A for CW operation on any band. Adjust the cores of T1 and T2 on the GEN board (X52-0009-00) for a maximum RF reading on the meter.

Do not adjust T3, T4 or T5 without a sweep and a marker generator. These transformers affect the bandpass of the transmitter.

6.5 HETERODYNE CRYSTAL OSCILLATOR

To adjust the heterodyne crystal oscillator frequency, locate the crystal oscillator coil in the coil pack behind the front panel. Adjust the coil as described below.

Turn the coil's core slowly clockwise until the oscillator just stops. Monitor the oscillation using the RF reading on the meter. Then turn the core ½ to 1 turn counterclockwise so that the circuit goes into oscillation again.

6.6 DRIVER TUNING (X40-0018-00 and X40-0017-00)

Locate the mixer tuning coils at the center of the coil pack (see Figure 8). The driver coils are near the final section. Set the MODE switch to CW and turn the DRIVE control to center scale.

Switch the T-599A to transmit and tune the mixer and driver coils for maximum output as shown on the RF reading of the meter. The coils are switched in series and paralled in the circuit so they must be tuned in the order given below.

BAND	FREQUENCY
3.5	3.750 MHz
28.5	28.800 MHz
21	21.225 MHz
14	14.175 MHz
7	7.150 MHz

6.7 NEUTRALIZATION

The T-599A does not require matched final tubes. However whenever you replace one or both of the final tubes, the PA section requires neutralization (see Figure 7).

Tune the transmitter into a dummy load for CW operation at 21.225 MHz and slide the TRANSVERTER switch to ON. Attach a sensitive RF VTVM (or oscilloscope) across the antenna connector and adjust neutralizing capacitor TC1 for minimum indication on the VTVM.

An alternative method is to use a receiver, tuned to the proper frequency, as an RF indicator. Tune TC1 for minimum indication on the S-meter. DO NOT connect the receiver directly to the output of the transmitter.

6.8 AM SET

Tune the transmitter for maximum CW output on the 14 MHz band. Set the METER switch to ALC and adjust the CAR LEVEL control for a meter reading of about 200 ma (on the IP scale).

Turn the METER switch to IP, the MODE switch to AM, and adjust the AM set control (VR3) for a meter reading of 120 ma (see Figure 8).

6.9 LUBRICATION AND CLEANING

Clean and lubricate the gears of the dial drive about once a year. Use a light machine oil. Clean the dial with a neutral solution because some harsh chemicals can remove the scale markings.

6.10 PILOT LIGHT REPLACEMENT

The pilot light should be replaced with an equivalent 8 volts 300 ma bulb.

6.11 ORDERING SPARE PARTS

When ordering replacement or spare parts for your equipment, be sure to specify the following information:

Model number and serial number of the equipment — schematic number of the part — and the board number on which the part is located.

Should it ever be necessary to return the equipment for repair be sure to pack it very carefully and include a full description of the problems involved.

Table 4 Voltage measurements

A

UNIT NO.	TRANSISTOR	NOTE 1	E	B	C
X50−0002−00	Q1 2SC460		0.85	1.4	9.0
	Q2 2SC460		1.55	2.2	9.0
X52−0009−00	Q1 2SC1000		1.2	1.9	4.5
	Q2 2SC733		0.35	0.9	2.1
	Q3 2SC733		1.50	2.1	3.8
	Q4 TA7045M	Refer next page "C" Table			
	Q5 3SK22	R S	Neto2 0 0.95	−4.8 0	−2.0 0
	Q6 2SA495	R S	6.8 Note2 2.2	6.2 1.5	0
	Q7 2SC460	R S	2.7 3.1	3.3 3.8	14.5 13.5
X47−0004−00	Q1 3SK22	R S	Note2 0 0.75	−3.75 0	−2.8 −0.5
	Q2 2SC535	SEP TRCV	1.7 0	1.25 0.2	7.5 8.0
	Q3 2SC460	SEP TRCV	2.7 0.87	1.55 1.48	7.5 8.0
	V1 12BY7A	Refer next page "C" Table			
X53−1030−10	Q1 2SC857	R S	−94 −95	−94 −95	−94 0
	Q2 2SC856	R S	−94 −50	−94 −50	6.3 Note3 1.5
	Q3 2SC735	ON OFF	0	0.74 0	0.09 14.5

UNIT NO.	TRANSISTOR	NOTE 1	E	B	C
X54−0001−00	Q1 2SC373	R A	0	0.65 0.6	0.13 0.65
	Q2 2SC373	R A	0	0.23 0.67	0 0
	Q3 2SC373		0.6	1.2	6.1
	Q4 2SC373	R V	0	0 0.25	8.5 0.65
	Q5 2SA562	R V	8.5 0.65	8.5 0.65	0
	Q6 2SC373	R V	5.4 4.5	6.0 0.65	6.3 8.6
	Q7 2SC373	R V	5.4 4.5	3.8 5.2	14.5 11.7
	Q8 2SA562	R V	14.5 13.3	14.5 12.5	0 13.2
X54−0002−00	Q1 2SC733		0.55	1.10	8.9
	Q2 2SC734		0.68	1.33	6.3
	Q3 2SC735		7.0	7.6	14.5
	Q4 2SA562		7.0	6.3	0
X43−0010−00	Q1 2SA606		14.5	13.8	9.0
	Q2 2SC372		5.3	5.9	13.8
	Q3 2SC372		5.5	5.7	5.9
	Q4 2SC372		5.5	6.15	9.0

Table 5 Voltage measurements

B

UNIT NO.	TER-MINAL	NOTE 1	VOLTAGE
X52-0009-00	AF5	Note4	1.4
	AF6	Note5	0.4
	CAR		(1.0)
	MG	R	−7.0
		S	0
	B1	R	14.5
		S	13.5
	B2	R	0
		S	13.5
	SM		0
	ALC	R	6.2
		S	Note3 1.5
	BS		9.0
	VFO		(1.0)
	OUT	R	(0)
		S	Note6 (0.5)
X50-0002-00	BS		9.0
	LSB		−0.4
	USB		−0.7
	CWT	R	14.5
		S	13.5
	OUT		(1.0)
X40-0016-00	R		5.4
	B		9.0
	OUT		(1.0)
X47-0004-00	14	R	14.5
		S	13.5
	9		9.0
	AS	SEP	3.0
		TRCV	0

UNIT NO.	TER-MINAL	NOTE 1	VOLTAGE
X47-0004-00	OS	SEP	0
		TRCV	0.17
	MG	R	− 7.1
		S	0
	OX	SEP	1.25
		TRCV	0.5
	OL		7.5
	MD	R	14.5
		S	13.5
	MVC	Note7	14.5
	DG	R	−46.0
		S	0
	H		6.3
	DP	R	318
	300	R	318
		S	290
	DVC	Note7	330
X53-1030-10	MG	R	− 7.0
		S	0
	DG	R	−46.0
		S	0
	RS	R	0
		S	−94
	KEY	R	0
		C	−60
	−C		−94
	PG	R	−94
		S	−50
	ALC	R	6.2
		S	Note3 2.1

UNIT NO.	TER-MINAL	NOTE 1	VOLTAGE
X53-1030-10	VR	R	−37
		S	−20
X54-0001-00	SS	R	14.8
		V	12.0
	RL	R	0
		V	13.2
	9V		9.0
	TV	Note8	8.5
	TB	R	8.5
		V	0.65
	TO	R	8.5
		V	0.65
	VS	R	3.8
		V	5.2
	14	R	14.8
		V	14.0
X54-0002-00	KY1	K	13.6
		C	12.8
	KY2	K	−60
		C	0
	OE	K	0
		Note9	1.6
	B	K	14.5
		C	13.5
X43-0017-00	IN	R	14.5
		S	13.5
	OUT		9.0
	RT1		5.4

UNIT NO.	TER-MINAL	NOTE 1	VOLTAGE
X43-0011-00	HV	R	338
		S	310
	850	R	910
		S	815
	300	R	315
		S	290
	C25	R	335
		S	315
	210	R	235
		S	215
	C26	R	242
		S	228
	−C	R	−94
		S	−97
	C28	R	−102
		S	−100
	14	R	14.8
		S	14.0
	14B	R	6.8
		S	6.6
	14A	R	5.7
		S	5.5
	100	R	75
		S	72
	230	R	187
		S	178
	320	R	260
		S	255

C

PIN	NOTE 1	Q4 TA7045M	V1 12BY7A	V1 S2001	V2 S2001
1	R	6.8	0	0	0
	S	Note3 1.7	2.6	1.1	1.1
2	R		−46	6.3	6.3
	S		0		
3	R	0	0	235	235
	S			215	215
4	R		0	0	0
	S			1.1	1.1
5	R	6.8	0	−94	−94
	S	Note3 1.7		−50	−50

PIN	NOTE 1	Q4 TA7045M	V1 12BY7A	V V1 S2001	V2 S2001
6	R	14.5	6.3	0	0
	S	13.5		1.1	1.1
7	R	0	318	0	0
	S	13.5	290		
8	R	14.5	200	0	0
	S	13.5	150		
9	R		0		
	S				
P	R			910	910
	S			815	815

Note 1 R: Under stand-by condition.
S: Under maximum CW transmitting output.
SEP: SEP◀▶ TRCV switch at SEP Position.
TROV: SEP◀▶ TRCV switch at TRCV Position.
A: 0.5V ANTI-VOX input Signal.
V: VOX and CW side tone Operations.
K: CW operation with Stand-by Key inserted.
C: CW operation with Key downed.
ON: VFO on
OFF: VFO off

Note 2 Read E.B and C as S.G1 and G2 respectively
D is same as 14 V Supply line.

Note 3 Approx. 5.5 V if meter set at ALC range does not deflect.
Note 4 MODE Switch set at AM. 0 at positions other than AM.
Note 5 MODE Switch set at Position TUN. CW and AM.
0 at Position other than TUN. CW and AM.
Nete 6 Value varies depending on how ALC circuit functions.
Note 7 3.5 MHz band. 0 for the band other than 3.5 MHz band.
Note 8 DELAY VR control placed in the extreme counterclockwise position.
Note 9 Operations other than CW operation.

* Measurement is made using a vacume tube voltmeter. The value shows the voltage to the chassis.
The value in ( ) denotes the AC voltage and that in { } the RF voltage.

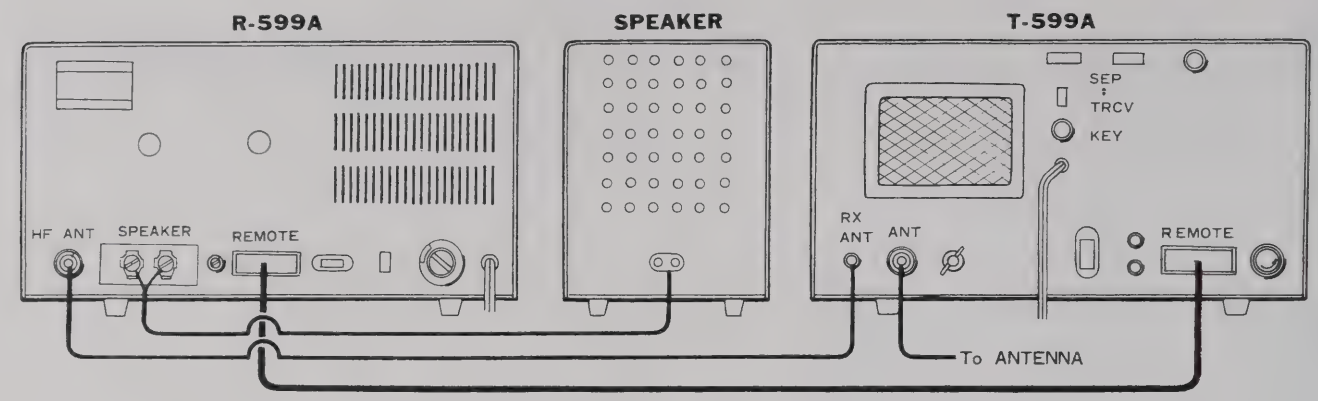
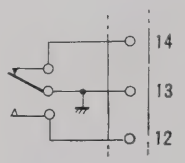
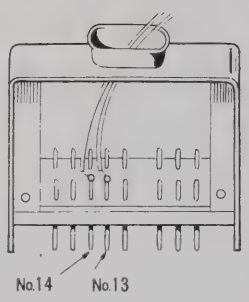


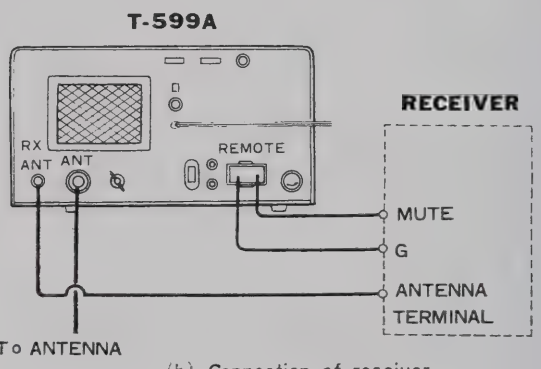
Figure 1 Interconnection of T-599A and R-599A receiver

An example in which switchover between the transmitter and the receiver is performed by tuning on and off the mute bias.
One contact of switching relay is repeated to terminals No.12, No.13 and No.14 respectively. Use these terminals after making reference to the use of the terminals in the text.
Solder lead wires to pins No.13 and No.14 of 16-pin.





(a) Connection diagram of socket



(b) Connection of receiver

Figure 2 Interconnection of T-599A with receiver other than R-599A

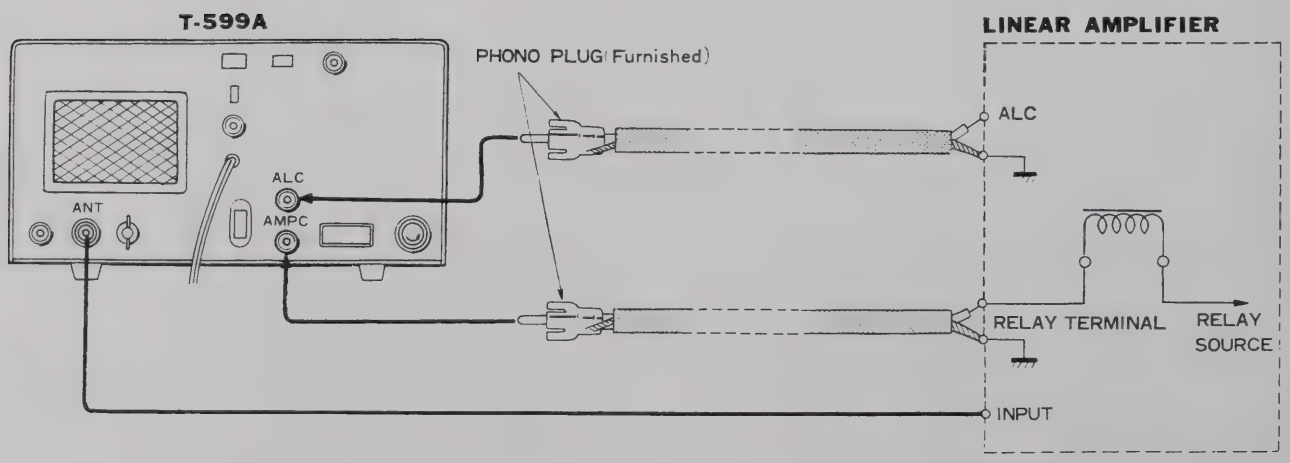


Figure 3 Interconnection of T-599A with linear amplifier

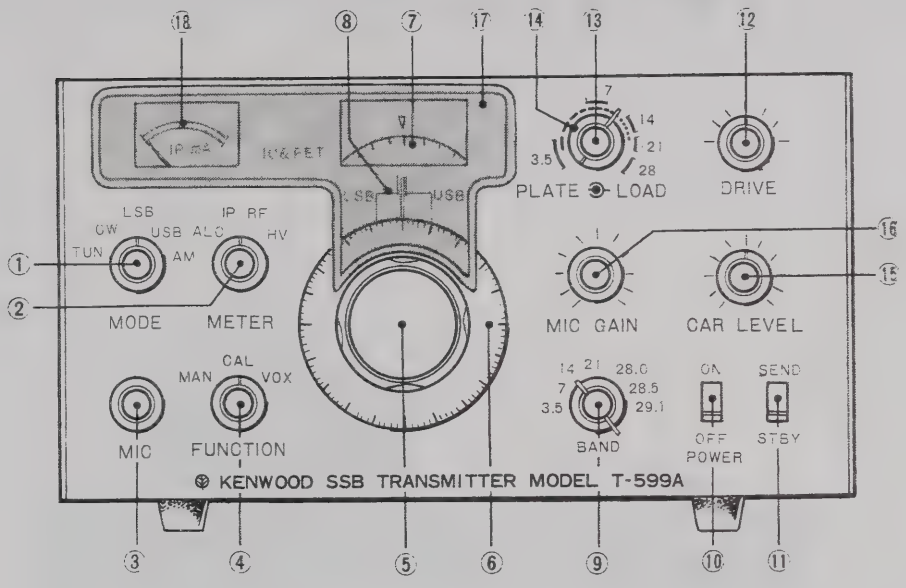


Figure 4 Front panel view

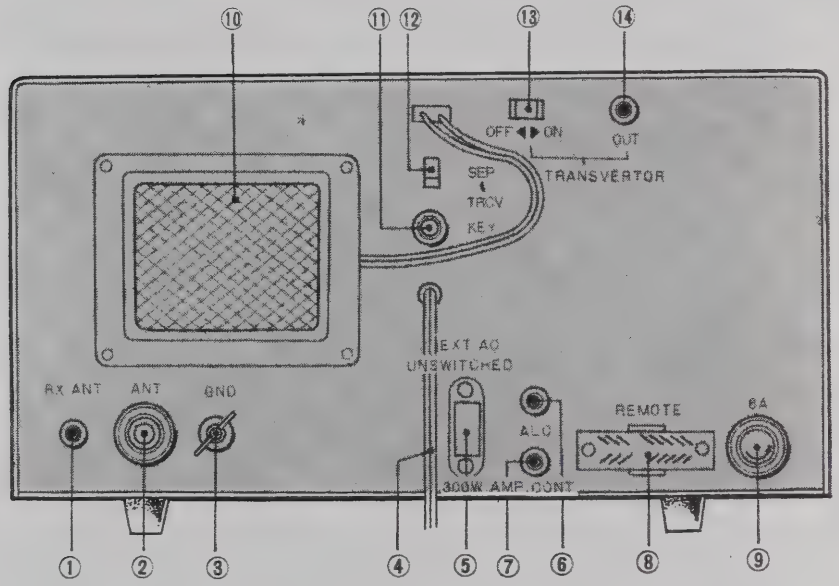


Figure 5 Rear panel view

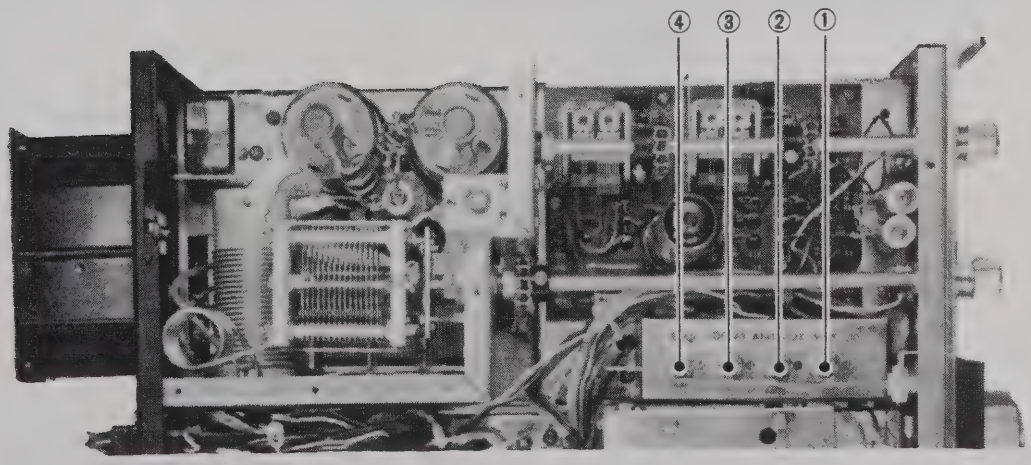


Figure 6
Chassis controls view

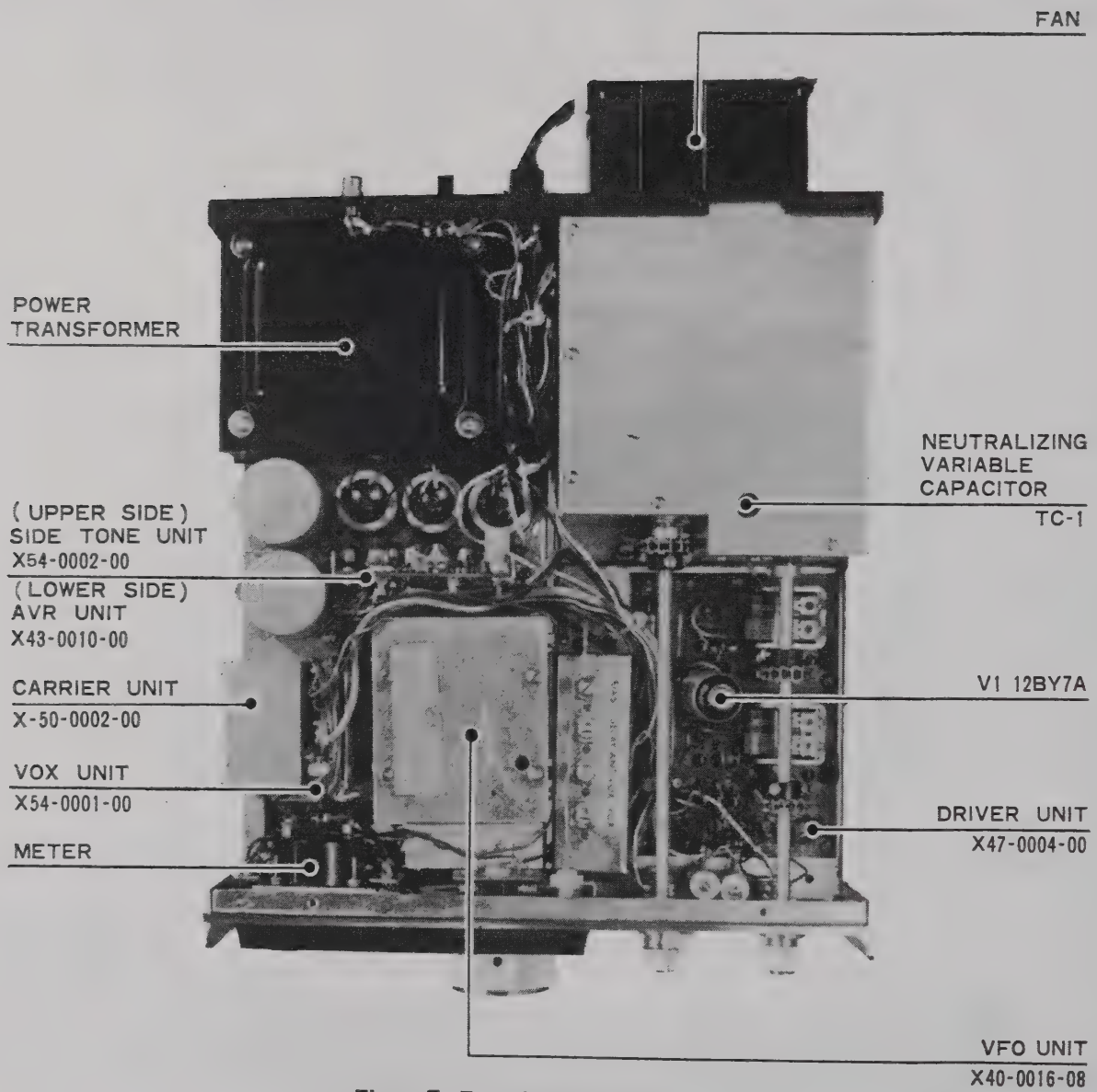


Figure7. Top chassis view

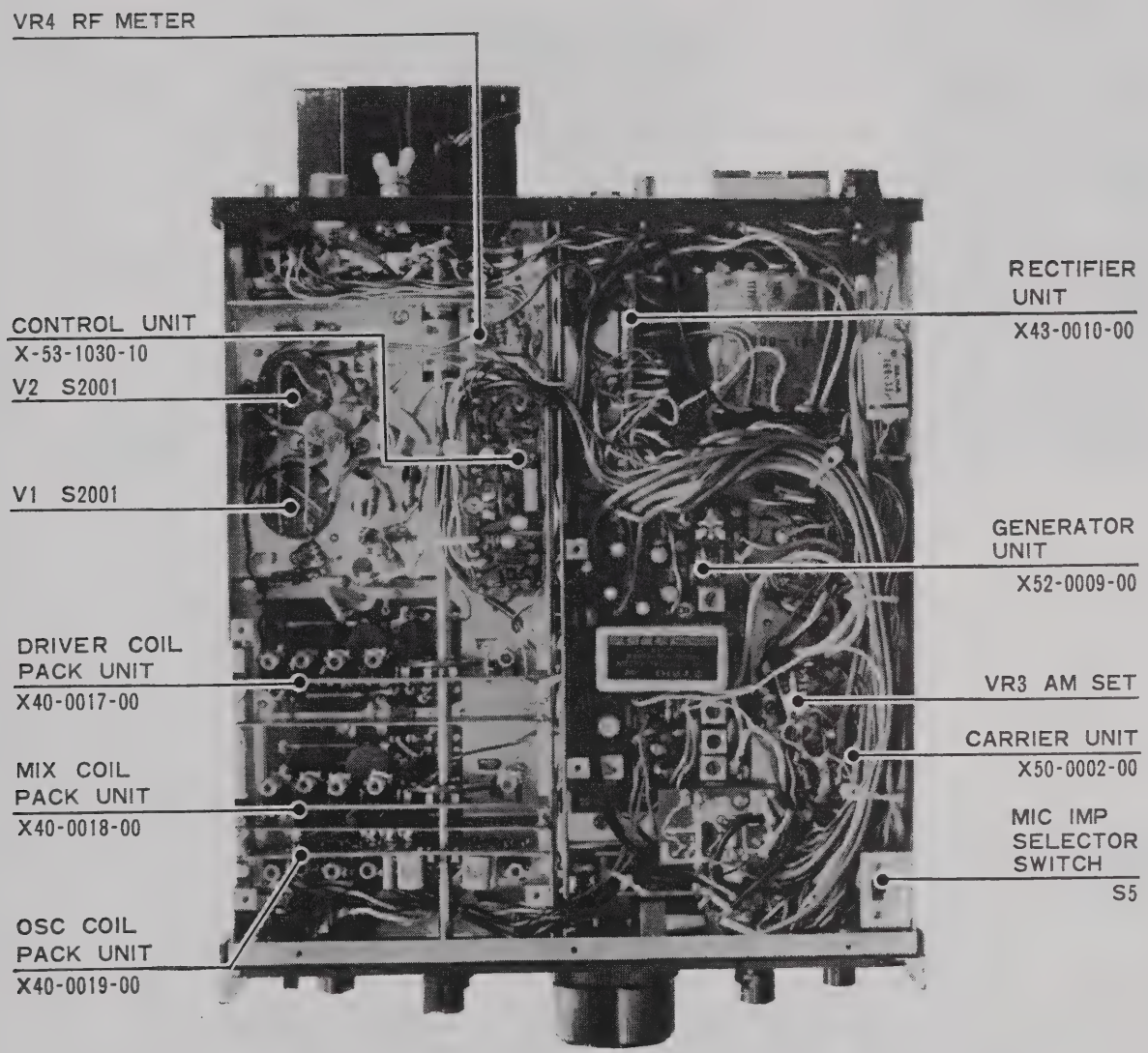


Figure 8 Bottom chassis view

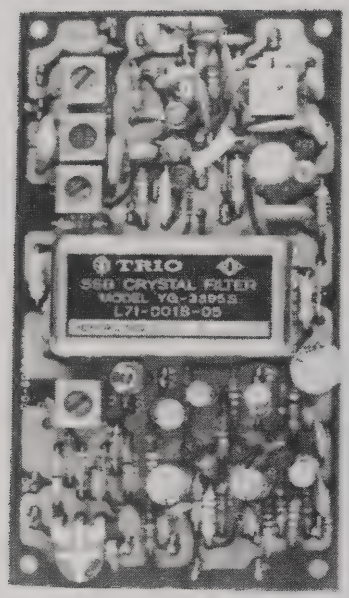


Figure9. Generator Unit

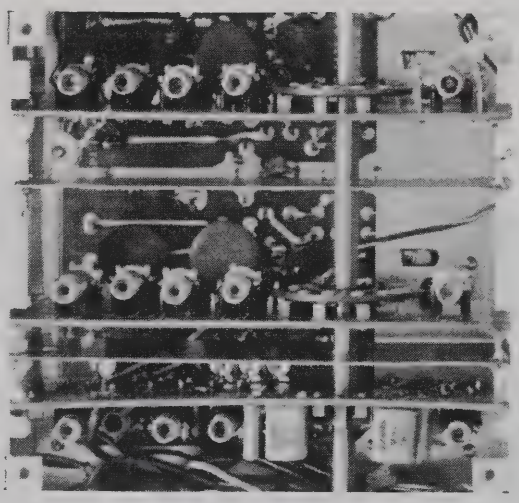


Figure10. Coilpack

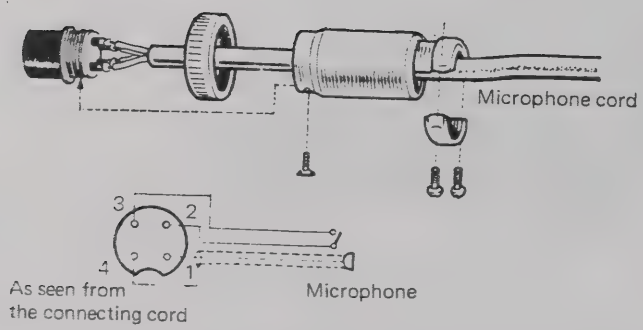


Figure 11 Microphone connection

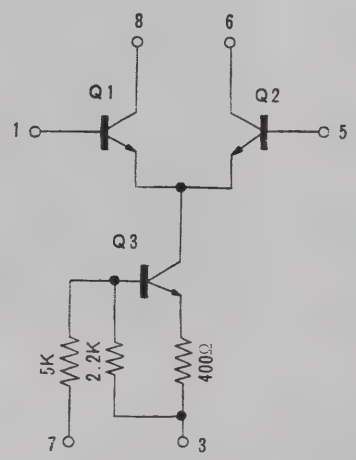


Figure12. TA7045M Internal Connections

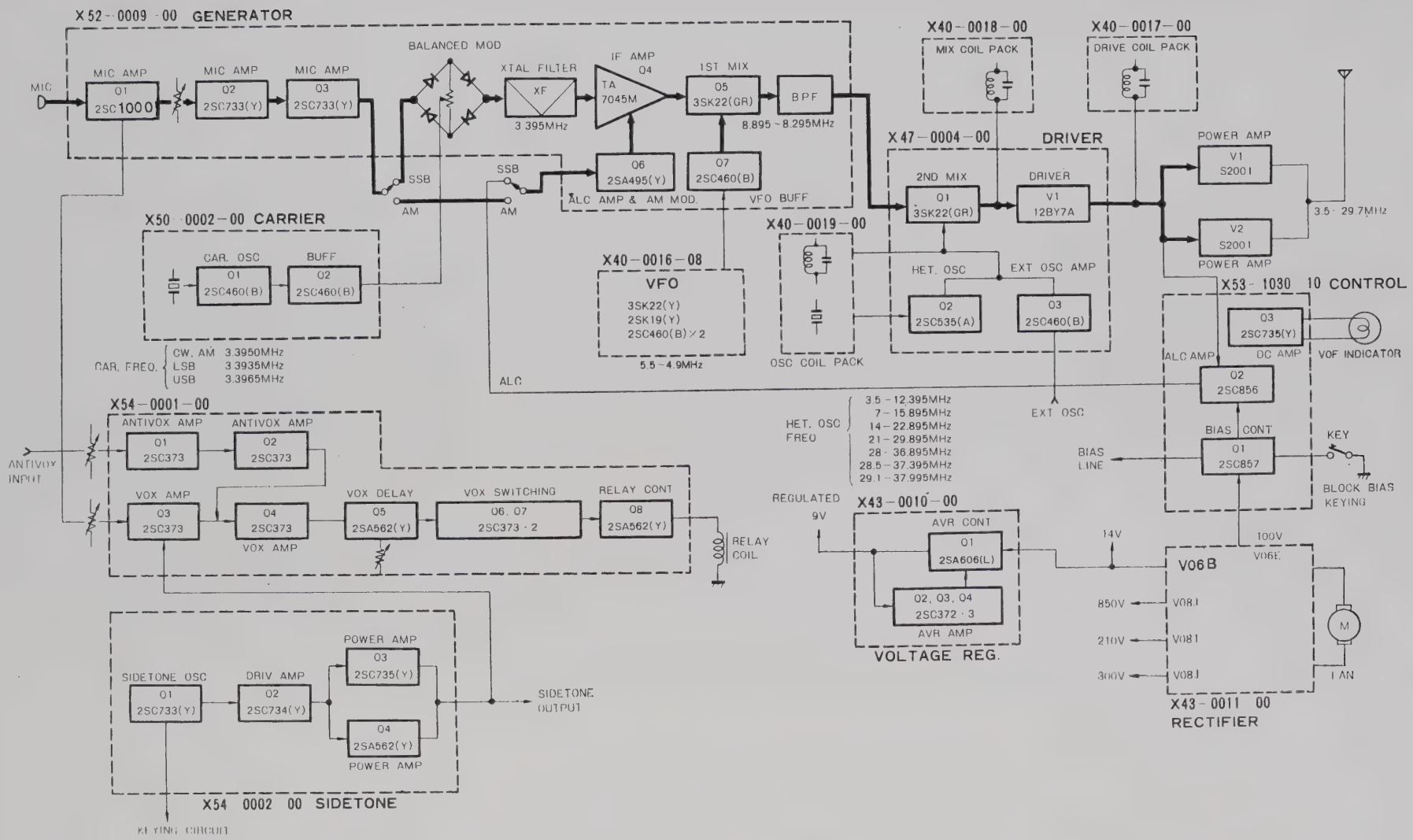


Figure 13 Block diagram

NOTE

NOTE

NOTE

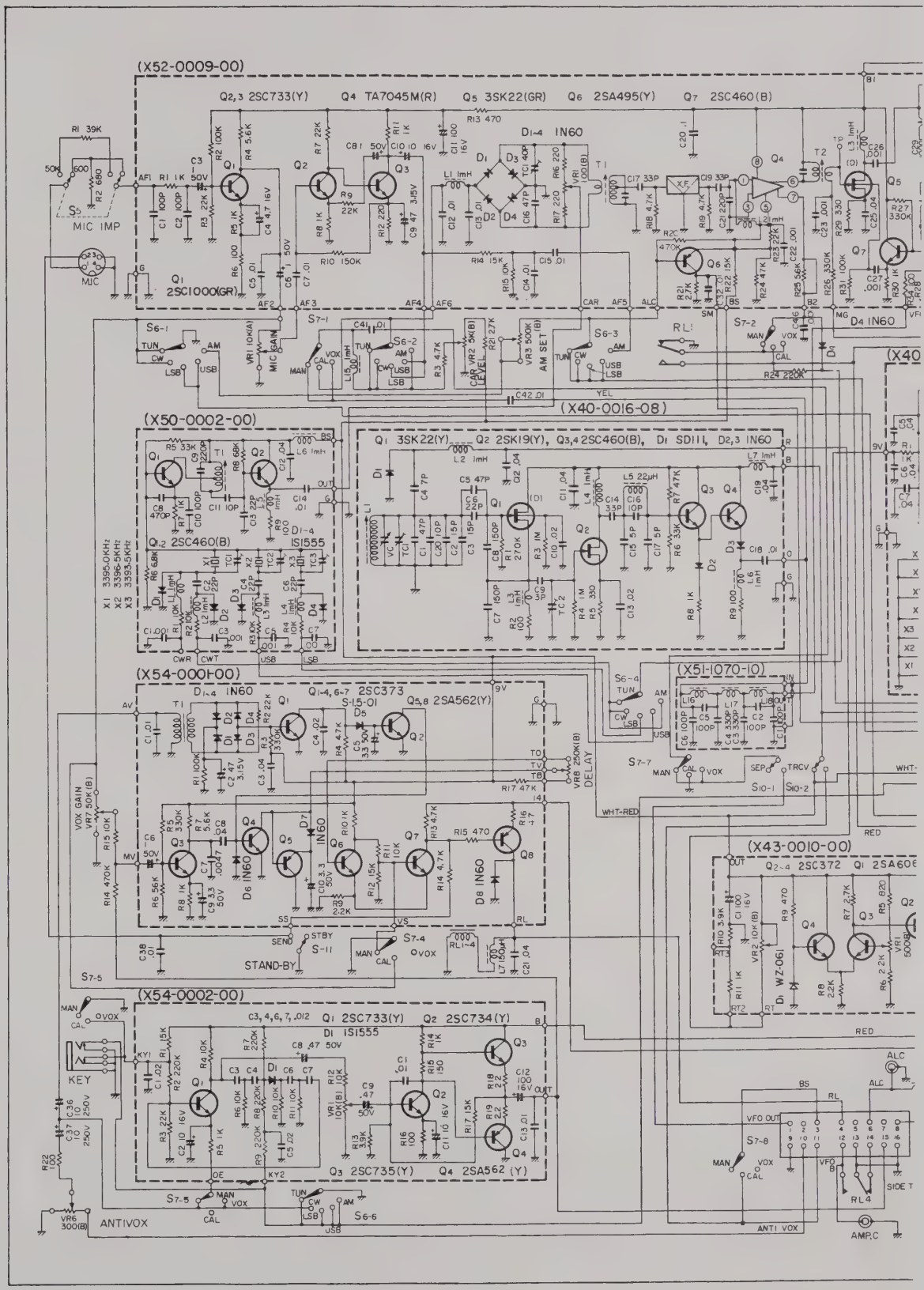


Figure 14 Sch

NOTE

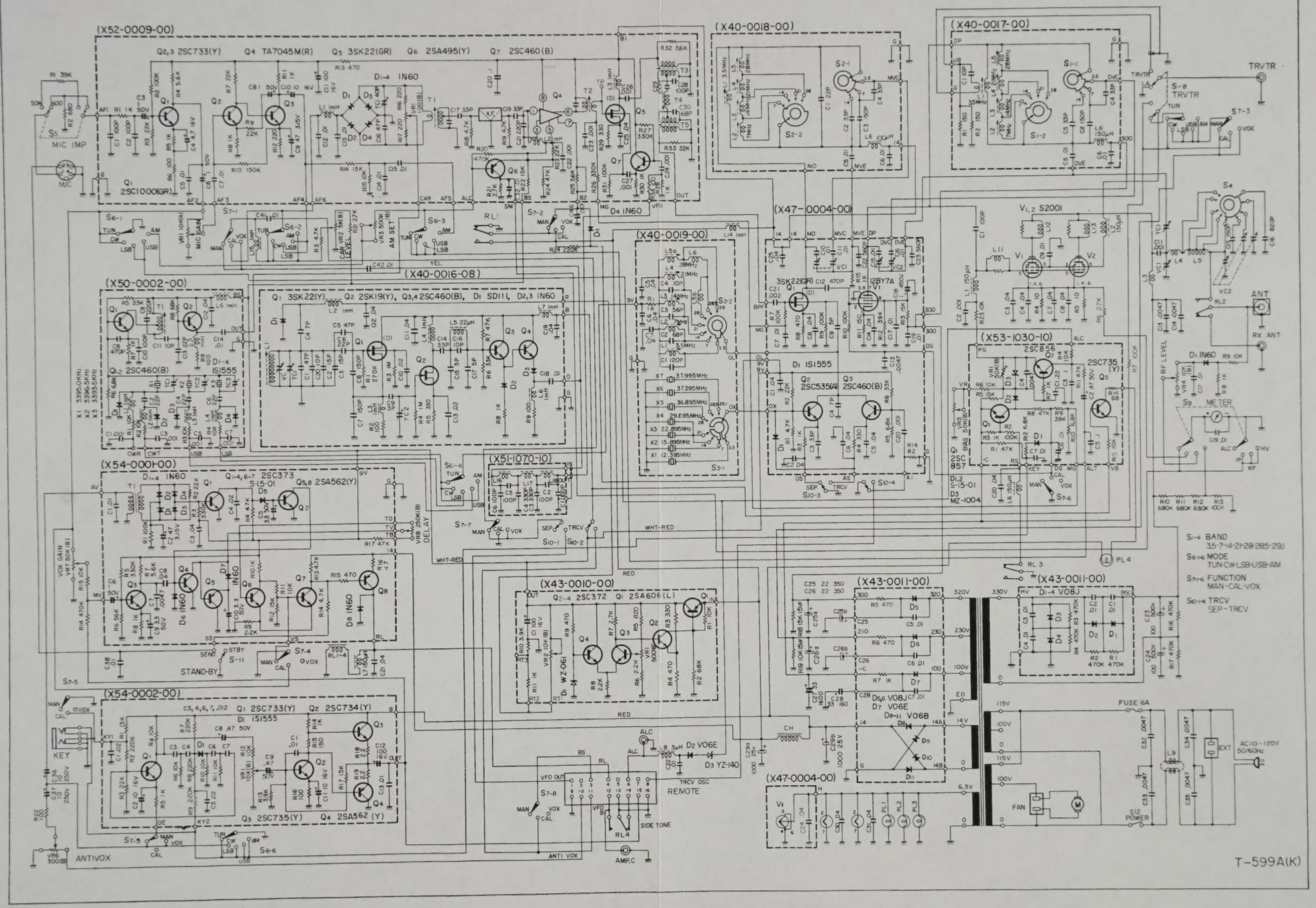
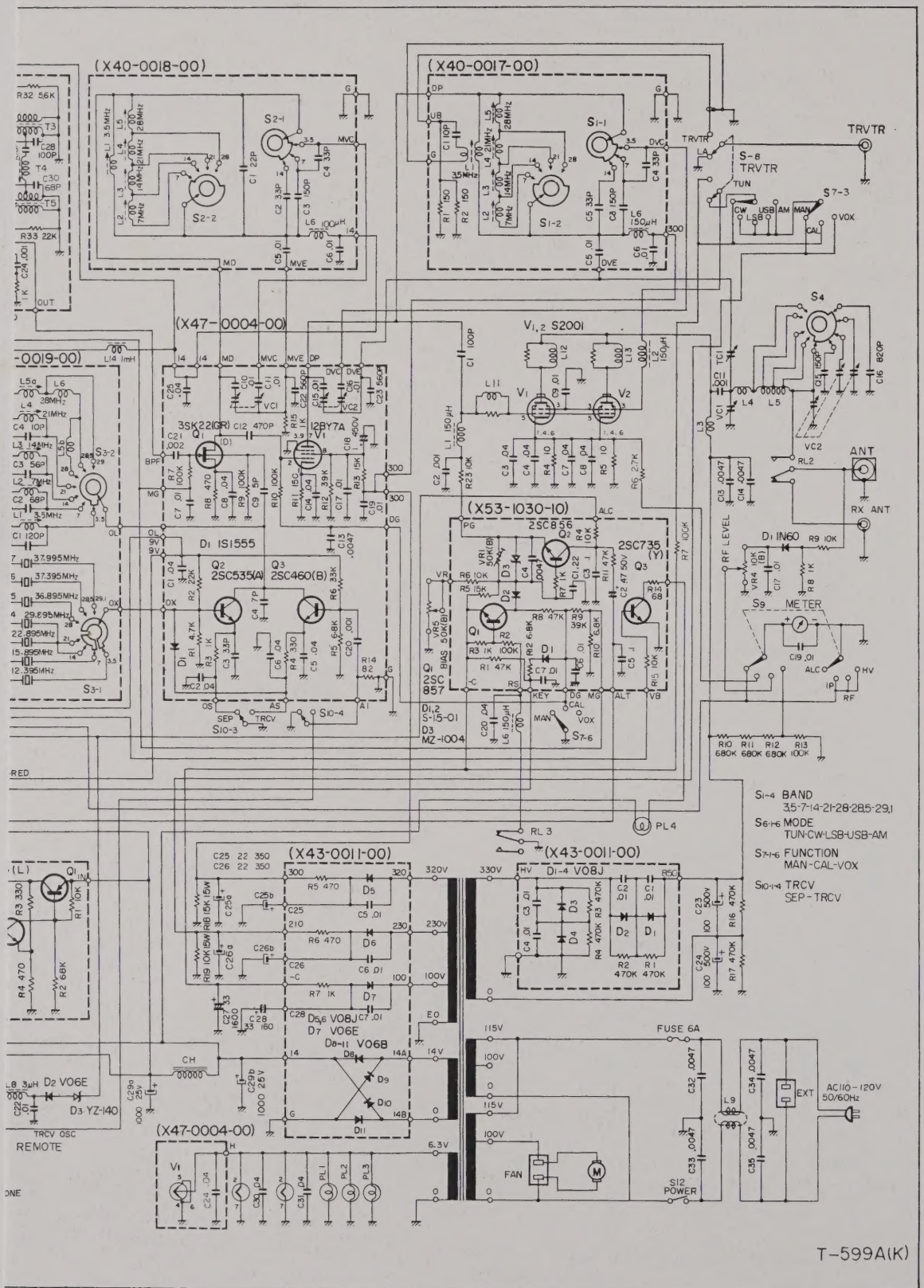


Figure 14 Schematic diagram



ematic diagram

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